

A New Species of *Microdictyon* Decaisne in New Zealand.

By VIVIENNE DELLOW,

Botany Department, Auckland University College.

Abstract.

A revision of the marine Chlorophyceae of New Zealand has involved a study of the plant which has previously been distributed as *Microdictyon umbilicatum* (Vellay) Zanard. It soon became evident that the New Zealand species was not identical with *M. umbilicatum*, and was sufficiently different to merit the rank of a new species. A description of this species follows, together with a discussion of its affinities.

Microdictyon mutabile sp. nov. Figs. 1-4.

Thalo recenter carpto colore viridissimo, siccato atrovirescente forma pulvini vel rosulato; lato 2-7cm., alto 1-5cm.; marginibus frondium rosulatorum irregulariter lobatis; ramis distichis vel impariter dispositis, saepe ad peripherum in compluribus planis; flabellatis vel recte angulatis; venatione non conspicua; filamentis primis 3-5 eminentibus; ramis plerumque acuto angulo, ad peripherum frondis latescentibus; thallo adfixo angustis tenuibusque cellulis rhizoideis saepe elongatis; septis praesentibus vel absentibus; cellulis rhizoideis 300-400 μ longis, simplicibus aut irregulariter bifurcis, ortis ab ima parte filamentorum principum aut deorsum ab articulo substrato paene recte linea adjacente; segmentis secundis anastomosis vel liberis; anastomose per anulos annularios in cacumine, non nunquam secundum muros adjacentes segmentorum; si quod textum, triquetrum plerumque, maxima latitudine 0.2-0.5mm.; segmentis primis 300-600 μ longis, 100-160 μ latis, a superiore parte paulo tumidis; cellulis plerisque ad marginem frondis decrescentibus; secundis segmentis coalescentibus 190-360 μ longis, 50-90 μ latis; minoribus diametro a termino ultimo segmenti; apicibus segmentorum obtusis; muris tenuibus; muris lateralibus 1.0-2.0 μ crassis; muris terminalibus 3.0-6.5 μ crassis; cellulis genitalibus insignibus projectibus conicis ad apicem cuiusque cellulae, unilatera dispositis.

Thallus bright green when fresh, dull blackish-green when dried, cushion-like or rosulate; 2-7cm. broad, 1-5cm. high; margins of rosulate fronds irregularly lobed; branching distichous to irregular, often in more than one plane at periphery, flabellate or rectangular; venation not conspicuous; 3-5 primary radiating filaments; angle of branching usually acute, becoming wider towards periphery of frond; attachment by narrow thin-walled, often elongated rhizoidal cells; septa present or lacking; rhizoidal cells 300-400 μ long, simple or irregularly forked, growing either from base of main filaments or downwards from a joint lying

more or less parallel and close to substratum; secondary segments anastomosing or free; anastomosis by annular rings at tips or occasionally along adjacent walls of segments; mesh when present usually triangular, 0.2-0.5mm. in longest diameter; primary segments 300-600 μ long and 100-160 μ broad, slightly swollen at upper ends; cells in general becoming smaller towards margin of frond; secondary anastomosing segments 190-360 μ long, 50-90 μ broad, smaller in diameter at distal end of segment; apices of terminal segments obtuse; walls thin; lateral walls 1.0-2.0 μ thick, terminal walls 3.0-6.5 μ thick; reproductive cells distinguished by conical projections near apex of each cell, unilaterally arranged.

Habitat: Locally abundant in dense or scattered clumps on *Corallina officinalis* (L) De Toni, between M.L.W.N. and M.L.W.S., flourishing on rocks of gentle slope in sheltered water, especially where there is a thin layer of silt or mud deposited on the coralline turf—a subordinate member of the *Corallina-Hormosira* association.

Type specimen No. 618 Herbarium U. V. Dellow (in Herbarium, Auckland Institute and Museum); No. 307, Fasc. XIII Herbarium V. W. Lindauer as *Microdictyon umbilicatum* (Velley) Zanard?

Distribution: Endemic. So far, *M. mutabile* has been recorded on the east coast of the North Island as far south as Mayor Island (37°20' S. Latitude). On the west coast the only record is from Anawhata (almost due west of Auckland). Urupukapuka Island (Otehei Bay, Bay of Islands); No. 10962 Herb. Lindauer, S. A. Rose; Herb. Auck. Museum. Anawhata; S. A. Rose, Herb. V. J. Chapman. Taranga Island; L. M. Cranwell, Herb. Auck. Museum. Opo Bay, Mayor Island; R. P. Bell, Herb. Auck. Museum. Leigh; No. 618 Herb. U.V.D. Whangaparaoa Peninsula; No. 469 Herb. U.V.D. Long Bay, Hauraki Gulf; No. 658 Herb. U.V.D. Narrow Neck; No. 693 Herb. U.V.D.

In most localities where this species occurs, two distinct growth forms can be found: one markedly spongiöse, forming a firm, compact cushion, the other displaying the more typical features of *Microdictyon*, with flat, expanded laminae aggregated into a rosulate thallus. Fewer anastomoses occur in the spongiöse growth form. There is also less variation in the number of primary radiating filaments, three acute-angled branches usually being present at each joint. In addition, cells at the base of primary filaments are slightly larger than those at the base of reticulate fronds. The distinction between the two forms is by no means clearly defined, since plane reticulate fronds have been found growing out from the base of spongiöse cushions. On the other hand, when reticulate fronds have been grown in culture for several months, the whole thallus has been found to develop into a lax series of filaments in which there is not a single anastomosis.

The plant has been named "mutabile" on account of its extreme plasticity both in culture and in its natural habitat.

AFFINITIES (a) Generic

Plants of the cushion-like growth form show a certain affinity to *Rhipidiphyllon* in their acute-angled, flabelliform branching, together

with a relatively low percentage of segments anastomosing by annual rings, but they are separated unquestionably from this genus by their much greater size (*Rhipidiphyllon* is only 2-4mm. broad—Boergesen, 1924, p. 250), the occurrence of septa in the thin-walled rhizoidal cells, and also by the fact that branching occurs in more than one plane.

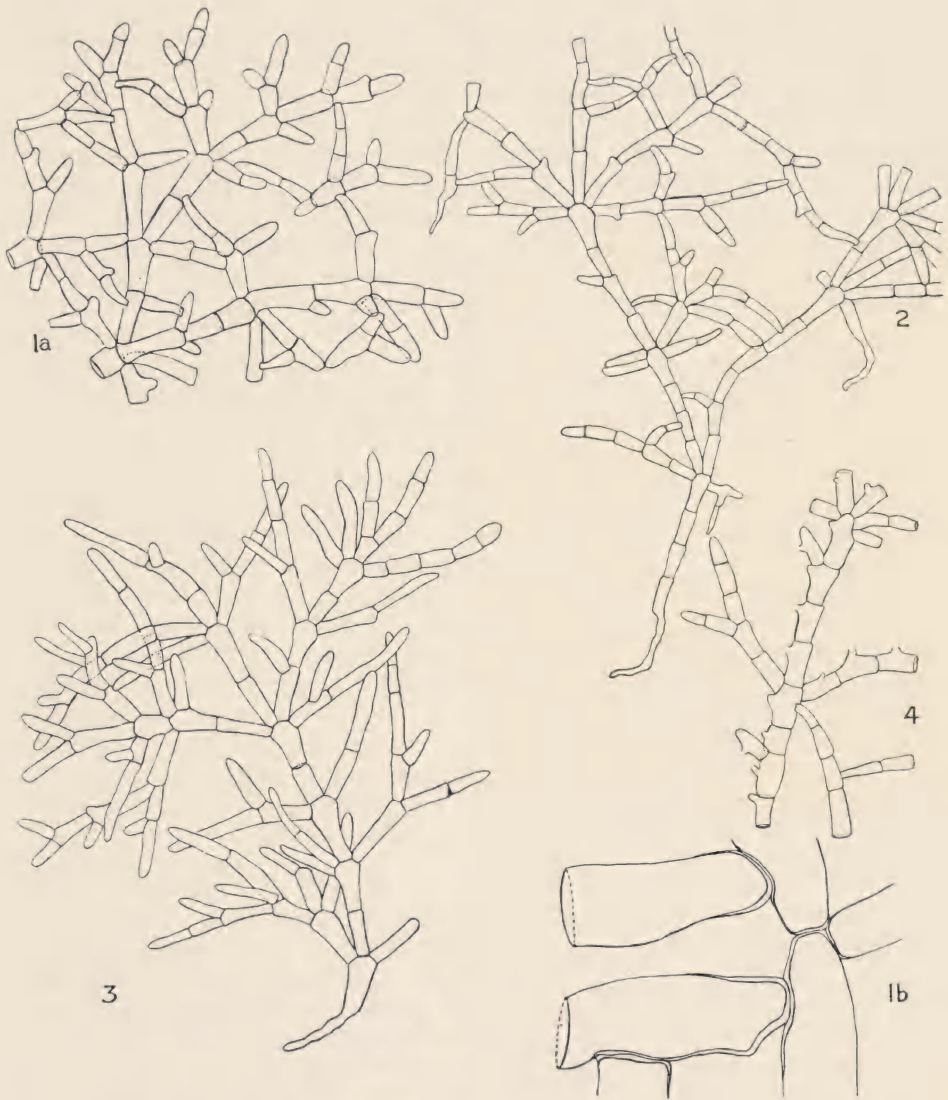


Fig. 1. (a) *Microdictyon mutabile*—portion of periphery of reticulate frond (type specimen). $\times 17$.

(b) Two secondary anastomosing segments, showing annular form of attachment. $\times 130$.

Fig. 2. *M. mutabile*—basal portion of type specimen. $\times 11$.

Fig. 3. *M. mutabile*—young plant of cushion form, from material collected at Whangaparaoa Heads, Hauraki Gulf (No. 469, Herb. U.V.D.). Note absence of anastomoses and polystichous branching. $\times 17$.

Fig. 4. *M. mutabile*—branch with small conical projections through which liberation of swarmer has taken place. $\times 17$.

A likeness to *Boodlea* is seen in the spongiöse habit and cell size. Apart from these two points of resemblance, *Boodlea* differs from *Microdictyon* in general in its lack of true distichous branching, and in its incurving ramuli; and from this species in particular in its tenaculoid anastomosing segments.

The occurrence of occasional adhesions of parallel segments along the longer axis of the cells (Fig. 2a) is reminiscent of *Anadyomene*.

(b) *Specific*

The importance of the nature of the structures of attachment in subdividing the different species of *Microdictyon* has been emphasized both by Reinbold (1913) and by Setchell (1929). Setchell groups the species primarily according to their mode of attachment, and secondarily according to the nature of ramification and resultant meshwork. *Microdictyon mutabile* fits most readily into the Calodictyon section of the genus, as defined by Setchell (1929, p. 502). Like other species in this section, it anastomoses by annual rings born on the tips of unmodified segments, it lacks regular venation, the branching is chiefly flabellate and acute-angled with meshes tending towards triangular, and there is a limited area of attachment.

Further evidence in favour of placing *M. mutabile* in this group is furnished by the known geographic distribution of the Section Calodictyon (Setchell, 1929, pp. 502, 580-584), which is represented by a greater number of species in the Pacific Ocean than in any other part of the world. Within the Calodictyon group the closest relationship of *M. mutabile* seems to be in the sub-group Atrovirescentes with *M. calodictyon* itself, which it resembles in cell size, in the nature of the reticulate frond, and in the lack of distinct venation. Characters which separate *M. mutabile* from *M. calodictyon* are the spongiöse growth form, the branching in more than one plane with fewer anastomoses, the lack of a truly umbilicate base, and the presence of branched rhizoidal cells.

M. mutabile differs strikingly from other members of this group, and indeed from most of the known species of *Microdictyon*, in the spongiöse form with its cushion-like habit and branching in several planes, together with the lack of a truly umbilicate base; but Setchell notes in connection with *M. montagnei* of the Boodleioides section (op. cit. p. 577), that specimens from the South Pacific "show a tendency to depart from the strict plane characteristic of the genus." This may be a homoplastic response to the set of environmental conditions peculiar to the above-mentioned geographical region, although it is just as likely to be an ecological response by the plants to exposure during low spring-tidal periods. The majority of hitherto described species appear to grow relatively deep down in the sublittoral region (Setchell, op. cit. pp. 471-473). It is of interest to note that the *Microdictyon spongiolum* of Berthold, which grows near the lowest level of the intertidal region at Naples and which shows polystichous branching, was held by Bitter (1900) to be identical with the true deep-water *Microdictyon* of that locality. He regards the change in habit and mode of branching to be due to the increase both in temperature and in light intensity.

M. mutabile differs from *M. umbilicatum* in possessing the following features: (a) a much smaller frond; (b) predominantly flabellate branching; (c) smaller primary segments, which are 3-4 times as long as broad; (d) smaller secondary segments; (e) thin, unstratified walls.

In the herbarium of the Auckland Institute and Museum there are a number of dried specimens assigned to *Microdictyon* which have been collected in different parts of the North Island of New Zealand. Microscopic examination shows that the majority belong without doubt to the *M. mutabile* assemblage. They include plants collected at Otehei Bay, Bay of Islands, by Miss S. A. Rose and Mr. V. W. Lindauer, and at Opo Bay, Mayor Island, by R. P. Bell. In some of the latter specimens, cells of the peripheral branches are shorter and broader in relation to their length than is customary for *M. mutabile*—100-140 μ long and 100 μ broad in many cases. The same holds for the minute (and probably incomplete) specimen found at Taranga Island by Miss L. M. Cranwell. This plant is notable for the abnormally great number of small, peripheral segments anastomosing both terminally and along lateral walls, the whole giving an appearance rather like *Anadyomene*. However, a portion of the reticulate material of the type specimen of *M. mutabile* when grown in culture for several weeks produced a similar close network with an abnormally high percentage of short anastomosing segments. It is probable, therefore, that Miss Cranwell's plant is an ecological variant of the typical reticulate frond with a more open mesh.

ACKNOWLEDGMENTS.

The writer is indebted to Miss R. F. de Berg, M.Sc., who originally started this work, for many valuable suggestions about its continuance. She would also like to thank the following: Mr. R. C. Cooper, for making available material in the Auckland War Memorial Museum; Mr. V. W. Lindauer, for the loan of specimens from his herbarium and for helpful criticism of the text; Professor V. J. Chapman, under whose guidance the work was carried out; and, lastly, Mr. K. J. Dellow, M.A., for patient assistance with the Latin translation.

REFERENCES.

- BITTER, GEORG., 1900.—Zür morphologie und physiologie von *Microdictyon umbilicatum*. *Pringsh. Jahrb.*, vol. 34, pp. 199-235, pl. 7.
- BOERGESEN, F., 1924.—Marine algae from Easter Island. In "Natural History of Juan Fernandez and Easter Island." Ed. Carl Skottsberg. Vol. II, pp. 251-253, figs. 3-4.
- REINBOLD, TH., 1913.—*Microdictyon*, in A. Weber van Bosse; Liste des algues du Siboga. *Siboga Exped. Mon.* 59a, pp. 66-68.
- SETCHELL, W. A., 1929.—The Genus *Microdictyon*. *Univ. of Calif. Publ. in Bot.* Vol. 14, No. 20, pp. 453-588.